

Reply to “Comment on ‘Critical Point Scaling of Ising Spin Glasses in a Magnetic Field’ ”

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In his Comment, Temesvári objects to a remark in our paper [Phys. Rev. B **91**, 104432 (2015)] that his result for the form of the Almeida-Thouless (AT) line obtained in an earlier paper with Parisi [Nucl. Phys. B **858**, 293 (2012)] in six dimensions can be obtained by taking the limit of $d \rightarrow 6$ in the equations valid for $d > 6$, but that this violated one of the inequalities needed for their validity. He is just pointing out that they gave a derivation of the form of the AT line in six dimensions in [Nucl. Phys. B **858**, 293 (2012)] which avoided this difficulty. However, it is still a perturbative approach, and does not deal with the lack of a perturbative fixed point found by Bray and Roberts [J. Phys. C **13**, 5405 (1980)] long ago.

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The point which Temesvári is making in the Comment¹ is not about the main subject of our paper²— which was on critical point scaling – but on two paragraphs in Sec. III of our paper where we described previous works on the Almeida-Thouless (AT) line. In particular he is objecting to the statements in our paper concerning our Eq. (13) for the form of the supposed AT line in six dimensions. In his earlier paper with Parisi⁴, they had derived the same equation. We remarked in our paper that this equation did not follow from the equations valid for $d > 6$, as to get it required violating the inequalities in Eq. (7) of his Comment and their equivalents in our own paper. He too makes the same point in his Comment. But what he is pointing out is that in Ref. 4 an alternate derivation of Eq. (13) was made, which is claimed to give the correct form for the assumed AT line in precisely six dimensions, which just happens to be the same equation that is obtained from using the equations for $d \rightarrow 6^+$ outside their limit of validity.

The work of Ref. 4 is a perturbative renormalization group (RG) calculation. Bray and Roberts⁵ showed many years ago there is no stable fixed point for the perturbative RG equations for the critical behavior across the supposed AT line in six dimensions and below. They suggested that this might imply that there was no AT line at and below six dimensions. This was the view taken in Ref. 3. What was done in Ref. 4 and in the Comment¹ was to simply assume that there was an AT line, despite the fact that within the perturbative RG theory for $d \leq 6$ it is has never proved possible to obtain it. Until Temesvári can overcome this difficulty it is hard to take seriously the claim that his perturbative calculation of the AT line for $d \leq 6$ has a shred of validity.

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¹ T. Temesvári, Phys. Rev. B

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³ M. A. Moore and A. J. Bray, Phys. Rev. B **83**, 224408 (2011).

⁴ G. Parisi and T. Temesvári, Nucl. Phys. B **858**, 293 (2012).

⁵ A. J. Bray and S. A. Roberts, J. Phys. C **13**, 5405 (1980).